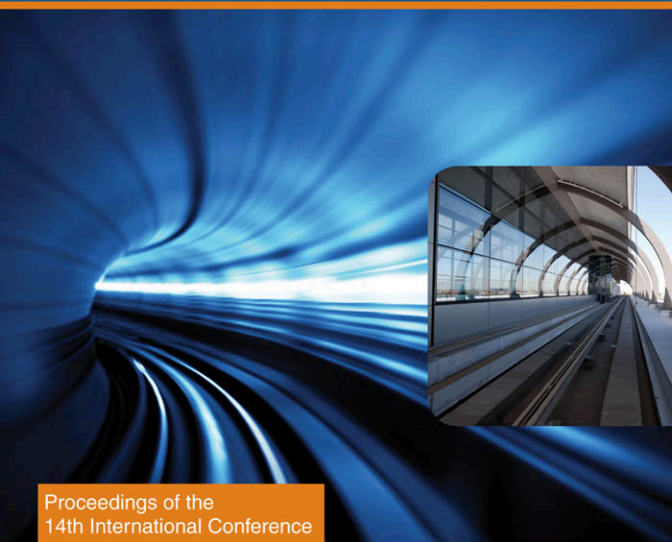


Automated People Movers and Transit Systems 2013

Half a Century of Automated Transit—
Past, Present, and Future



Proceedings of the
14th International Conference

ASCE

EDITED BY
William H. Leder, P.E.

William J. Gonsky, Ph.D., P.E.



TRANSPORTATION
& DEVELOPMENT
INSTITUTE

This is a preview. [Click here to purchase the full publication.](#)

AUTOMATED PEOPLE MOVERS AND TRANSIT SYSTEMS 2013

*HALF A CENTURY OF AUTOMATED TRANSIT—PAST,
PRESENT, AND FUTURE*

PROCEEDINGS OF THE FOURTEENTH INTERNATIONAL
CONFERENCE

April 21-24, 2013
Phoenix, Arizona

SPONSORED BY
The Transportation & Development Institute (T&DI)
of the American Society of Civil Engineers

EDITED BY
William H. Leder, P.E.
William J. Sproule, Ph.D, P.E.



TRANSPORTATION
& DEVELOPMENT
INSTITUTE

Published by the American Society of Civil Engineers

Cataloging-in-Publication Data on file with the Library of Congress.

American Society of Civil Engineers
1801 Alexander Bell Drive
Reston, Virginia, 20191-4400

www.pubs.asce.org

Any statements expressed in these materials are those of the individual authors and do not necessarily represent the views of ASCE, which takes no responsibility for any statement made herein. No reference made in this publication to any specific method, product, process, or service constitutes or implies an endorsement, recommendation, or warranty thereof by ASCE. The materials are for general information only and do not represent a standard of ASCE, nor are they intended as a reference in purchase specifications, contracts, regulations, statutes, or any other legal document. ASCE makes no representation or warranty of any kind, whether express or implied, concerning the accuracy, completeness, suitability, or utility of any information, apparatus, product, or process discussed in this publication, and assumes no liability therefore. This information should not be used without first securing competent advice with respect to its suitability for any general or specific application. Anyone utilizing this information assumes all liability arising from such use, including but not limited to infringement of any patent or patents.

ASCE and American Society of Civil Engineers—Registered in U.S. Patent and Trademark Office.

Photocopies and permissions. Permission to photocopy or reproduce material from ASCE publications can be obtained by sending an e-mail to permissions@asce.org or by locating a title in ASCE's online database (<http://cedb.asce.org>) and using the "Permission to Reuse" link. *Bulk reprints.* Information regarding reprints of 100 or more copies is available at <http://www.asce.org/reprints>.

Copyright © 2013 by the American Society of Civil Engineers.

All Rights Reserved.

ISBN 978-0-7844-1286-2 (print)

ISBN 978-0-7844-7782-3 (PDF)

Manufactured in the United States of America.

Preface

The 14th International Conference on Automated People Movers and Automated Transit Systems was held at the Phoenix Marriott Mesa Hotel in Mesa, Arizona. The theme of the conference was *Half a Century of Automated Transit – Past, Present and Future*. Almost half a century ago the Urban Mass Transportation Act of 1964 provided \$375 million in matching funds for public transit in the United States and this legislation has been seen as the beginning for APMs. In terms of an historical perspective, it is noted that the 1966 Reuss-Tydings Amendments to the original 1964 legislation required, among other things, that the Secretary of Housing and Urban Development “...undertake a project to study and prepare a program of research, development, and demonstration of new systems of urban transportation that will carry people and goods within the metropolitan area speedily, safely, without polluting the air, and in a manner that will contribute to sound city planning.”

The Conference Proceedings include over 50 papers that looked back over the past fifty years of APM development, examined the current state of APMs and ATS, and explored what the future might hold. The papers covered a wide range of topics including history, Personal Rapid Transit (PRT) applications, airport projects and other major activity centers, system improvements, facility planning and design, safety, security, standards, automated train control, and policy. All papers included in the Proceedings have been peer reviewed and accepted for publication.

The Phoenix area provided an exciting setting for the conference as a technical tour and several papers focused on the new PHX Sky Train™ APM at the Phoenix Sky Harbor International Airport. The first phase of this APM had just opened for public service, and the system included several significant fixed facility and operating system components.

The first conference was held in Miami, Florida in 1985 and since that time subsequent conferences have brought together planners, inventors, designers, suppliers, builders, owners and operators of automated transit of all forms to share their experiences, reveal innovations, and discuss what they have learned. Past conferences have been held around the globe and have built an international collegial community and the Proceedings have become an invaluable reference source. In 2011, automated transit systems were added to the automated people mover focus in recognition of exciting applications on line haul metro systems, and the Phoenix conference continued that addition.

1985 Miami, Florida
1989 Miami, Florida

2001 San Francisco
2003 Singapore

1991	Yokohama, Japan	2005	Orlando, Florida
1993	Irving, Texas	2007	Vienna, Austria
1996	Paris, France	2009	Atlanta, Georgia
1997	Las Vegas, Nevada	2011	Paris, France
1999	Copenhagen, Denmark	2013	Phoenix, Arizona

The editors acknowledge the significant efforts of the many authors and reviewers who through their efforts have created these Proceedings in both time and place.

Bill Sproule
Bill Leder

Acknowledgments

Conference Steering Committee

- Steve Perliss, P.E., M. ASCE, Principal, Lea+Elliot, Inc., San Francisco, CA, Co-Chair
- William Leder, P.E., F. ASCE, Adjunct Professor, Michigan Technological University, Houghton, MI, Co-Chair
- James Spakauskas, Bombardier Transportation, Exhibits & Sponsors

Organizing Partners

- City of Phoenix, Sky Harbor International Airport

Conference Staff

- Jonathan C. Esslinger, P.E., F.ASCE, CAE, Director of Transportation & Development Institute, ASCE, Reston, VA
- Andrea C. Baker, Aff.M.ASCE, Manager of Transportation & Development Institute, ASCE, Reston, VA
- Susan Long, Manager, Conference & Meeting Services, ASCE, Reston, VA
- Yin Feng, Coordinator, Conference & Meeting Services, ASCE, Reston, VA
- Donna Dickert, Acquisitions Editor, ASCE, Reston, VA
- Sean Scully, Manager, Sponsorship & Exhibit Sales, ASCE, Reston, VA

Proceedings Co-Editors

- William Leder, P.E., F.ASCE, Adjunct Professor, Michigan Technological University, Houghton, MI
- William Sproule, Ph.D., P.E., F. ASCE, Professor, Michigan Technological University, Houghton, MI

Paper Reviewers

Bob Allman
George Hacken
Bill Leder
David Little
J. Sam Lott
Lee Mitchell

Bill Sproule
Matt Sturgell
Peter Syntax
Nate Walnum
Jack Weaver

APM Conference Proceedings

Automated People Movers – Engineering and Management in Major Activity Centers, Proceedings of an International Conference on Automated People Movers, Miami, FL, Edited by Edward S. Neumann and Murthy V.A. Bondada, American Society of Civil Engineers, Reston, VA, March 1985

Automated People Movers II – New Links for Land Use: Automated People Mover Opportunities for Major Activity Centers, Proceedings of Second International Conference on Automated People Movers, Miami, FL, Edited by Murthy V.A. Bondada, William J. Sproule, and Edward S. Neumann, American Society of Civil Engineers, Reston, VA, March 1989

Automated People Movers Movers III – Future Prospects for APMs, Proceedings of Third International Conference on Automated People Movers, Yokohama, Japan, Edited by Takashi Inouye, Takeshi Kurokawa, and William J. Sproule, Japan Society of Civil Engineers and Japan Transportation Planning Association, Tokyo, Japan, October 1991

Automated People Movers IV – Enhancing Values in Major Activity Centers, Proceedings of Fourth International Conference on Automated People Movers, Irving, TX, Edited by William J. Sproule, Edward S. Neumann, and Murthy V.A. Bondada, American Society of Civil Engineers, Reston, VA, March 1993

Automated People Movers V – APMs Toward the 21st Century, Proceedings of Fifth International Conference on Automated People Movers, Paris, France, Chairman Y. David, AFCET and ASCE, June 1996

Automated People Movers VI – Creative Access for Major Activity Centers, Proceedings of Sixth International Conference on Automated People Movers, Las Vegas, NV, Edited by William J. Sproule, Edward S. Neumann, and Stanford W. Lynch, American Society of Civil Engineers, Reston, VA, April 1997

Automated People Movers VII – APMs in Urban Development, Proceedings of the Seventh International Conference on Automated People Movers, Copenhagen, Denmark, Chairman L.K. Eriksen, The Society of Danish Engineers, May 1999

Automated People Movers 2001 – Moving Through the Millennium, Proceedings of the Eighth International Conference on Automated People Movers, San Francisco, CA, Edited by Robert R. Griebenow and Ramakrishna R. Tadi, CD-ROM, American Society of Civil Engineers, July 2001

Automated People Movers – Connecting People and Places, Proceedings of the Ninth International Conference on Automated People Movers, Singapore, CD-ROM, Association of Consulting Engineers - Singapore and ASCE, September 2003

Automated People Movers 2005 – Moving to Mainstream, Proceedings of the Tenth International Conference on Automated People Movers, Orlando, FL, CD-ROM, American Society of Civil Engineers, Reston, VA, May 2005

Automated People Movers 2007 – The Sound of Moving People, Proceedings of the Eleventh International Conference on Automated People Movers, Vienna, Austria, CD-ROM, Arch+Ing Akademie and ASCE, April 2007

Automated People Movers 2009 – Connecting People, Connecting Places, Connecting Modes, Proceedings of the Twelve International Conference, Atlanta, GA, Edited by Robert Griebenow, American Society of Civil Engineers, June 2009

Automated People Movers and Transit Systems 2011 – from People Movers to Fully Automated Urban Mass Transit, Proceedings of the Thirteenth International Conference, Paris, France, Edited by William H. Leder and William J. Sproule, Ingenieurs et Scientifiques de France and ASCE, May 2011 (*an electronic publication available from ASCE*)

Automated People Movers and Transit Systems 2013 – Half a Century of Automated Transit: Past, Present and Future, Proceedings of the Fourteenth International Conference, Phoenix, Arizona, Edited by William H. Leder and William J. Sproule, American Society of Civil Engineers, April 2013

This page intentionally left blank

Contents

Airports

APMs and Airport Mobility—Historic Trends and Future Possibilities	1
David D. Little and Sarah Elizabeth Ross	
Airport APMs—History and Future.....	14
William H. Leder and William J. Sproule	
Planning Partnership: Support for the PHX Sky Train.....	38
J. A. Capelli and A. D. Novak	
Phoenix Sky Harbor International Airport: PHX Sky Train—Making Tracks in the Arizona Desert	56
Anne Kurtenbach and Darryl Jaquess	
Chicago O'Hare Airport Transit System: Sustainable Ground Transportation	68
Rosemarie S. Andolino, Diane Woodend Jones, and Chris Gambla	
The Sacramento International Airport APM—Takeaways from the Early Under-Budget Big Build	81
Jenny Baumgartner, Brad L. Bonn, and Harley L. Moore	
Delivering an APM to the Sacramento County International Airport	91
Brandon Kameg and Glenn Morgan	
Seattle Tacoma International Airport STS: APM and Airport Growing Together	102
David D. Tomber and Sebastian Gladney	
Maintaining Reliable Service While Expanding the World's Busiest Airports	113
David W. T. Ewing, Norman May, John Kapala, and Steve Poerschmann	
Evaluation of Passenger Satisfaction with the Heathrow PRT System.....	127
P. H. Bly, J. C. Hammersley, and M. V. Lowson	

Major Activity Centers and Urban Systems

Mirage/Treasure Island Automated People Mover: Safe Operations for 19+ Years	143
J. David Mori and Antonio Garcia	
Aerial Transit Link—New York City.....	151
Jim Fletcher and Mike Deiparine	
APM History in Canada	173
William J. Sproule	
Automated Light Metro for Honolulu.....	182
Mike Bogonovich	
Automated Systems for Last Mile Connections at High-Speed Rail Stations	204
J. Sam Lott	